

Conference Report

Printed Electronics Europe 2009 & Photovoltaics Beyond Conventional Silicon Europe 2009: April 7-8, 2009 – Dresden, Germany

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General summary

Because of the overlapping players in the field, Printed Electronics Europe 2009 (PE) was co-located with Photovoltaics Beyond Conventional Silicon Europe 2009 (PV). The exhibition, key note speeches, and networking events were shared between them. Talks in the PE part run in two parallel tracks, whereas the PV part runs in a single track. In addition to the oral presentations, there was an exhibition hall with almost 70 exhibitors. There was no poster session in Dresden this year. The venue in the middle of the "Silicon Saxony" area was proper for the conference and all the practical arrangements were made professionally. General information of these two parallel conferences can be found in.

Table 1: General Information on Printed Electronics and Photovoltaics beyond conventional silicon Europe '09	Printed Electronics Europe '09 and Photovoltaics Beyond Conventional Silicon Europe '09	
	Attendance information	Number
	Attendees	760 from over 30 countries
	Exhibitors	67
	Oral presentations in Printed Electronics Europe 2009	58
	Oral presentations in Photovoltaics Beyond Conventional Silicon Europe 2009	27

Most relevant talks

An interesting detail describing the current activity of printed electronics is the estimation made by **IDTechEX** saying that currently, about 2250 organisations are developing this technology area. Until now the chemical suppliers, machinery suppliers, and research organisations have shown the greatest interest. This implies an unbalanced value chain where the field is currently lacking the application producers selling products to the brand holders. This is why the Printed Electronics Europe was focused on the needs of end users.

As a result of the ongoing activities, it is estimated for printed and potentially printed electronics that the market will grow from current (2009) \$1.9 billion to \$57 billion by 2019. Among the different segments of the printed electronics, the market for printed transistors will be especially interesting. It is estimated to grow from the current, practically non-existent market size to \$8 billion in ten years. It will be boosted by the backplane thin film transistor (TFT) technology, which will be sold as a part of active matrix displays and electronic reader applications.

Ravensburger represented their experiences from implementing printed electronics to their board game. King Arthur (launched 2003) was the first electronic board game. It used the Touch and Play technology developed in cooperation with PolymerVision. Despite the difficulties with cost-efficiency and reliability, the game itself was a success. In a subsequent game (Die Insel, 2005), printed electronic components were implemented with improved reliability but the cost issues still remained. For future games it must be proven that printed electronics can be printed on card boards in a cheap way using mass production methods.

Plastic Logic presented eReader as a product application. This product drew a lot of interest and made their booth one of the most visited in the conference. The Plastic Logic eReader is aimed to replace paper based reading concept. It is a large readable display supporting the most common document formats as well as newspapers, periodicals and books. The reader incorporates E Ink technology which enables the readability and features low power consumption and long battery life. E ink is bistable and takes power only when refreshed (page turned). The pages stay on without power up to weeks. Product pricing will be announced in early 2010.

At the interface between silicon and printing based technology **Kovio** presented their technology which is based on silicon inks. The inherent advantage of the Kovio printed silicon technology platform over alternatives like organic electronics is that printed silicon enables significantly higher performance, lower power consumption and environmental stability. The presentation at the conference concentrated at item level intelligence. It is estimated that once the price of individual tags reaches below 5 cents, trillions of units can be sold.

Thin Film Electronics presented their technology in roll-to-roll printed memory devices. Although the cost of today's Si based memory devices is practically zero/bit, for low storage applications the cost is dominated by chip attachment. The printed batteries offer easy attachment, are flexible, and do not require battery to keep the data. The structure of the presented memory device is 5 layers, which are realised by direct gravure, micro gravure, and rotary screen printing. The possible applications areas range from game cards, toys, and logistics to anti counterfeit solutions.

On the photovoltaics side, the presentation made by **Konarka** gathered the most interested audience. They told about their continuous roll-to-roll high volume production of semiconducting polymer and fullerene based solar cells. Their production is done in ambient conditions using low temperature and low cost methods. No clean room facilities are required. Regarding the current energy conversion efficiency, the modules with about 300 mW of output power and 5.6 V of output voltage represent efficiency of 2-3%. The cells and modules have already been tested in accelerated lifetime laboratory tests as well as in outdoors. The lifetime target is set to 3-5 years for plastic encapsulated and 10-15 years for glass encapsulated modules.

General notes

RFID and item level packaging were tackled in many presentations in the PE part of the conference. Despite the progress in this field, it is still unclear how the cost targets for the related technologies are met. It is estimated that the antenna part alone ruins the cost targets of an RFID tag. It was, however, pleasant for the audience to see also many other possible application areas for printed electronics. These include, in addition to the above mentioned electronic readers, e.g. display applications of various kinds, smart textiles, tickets, and large-area sensors.

As a general note of the PV part, the state-of-the-art performance figures in 2009 seem to be more than 5% for (individual) printed solar cells and 2-4% for printed solar cell modules. The performance improvement has to be substantial for both printed photovoltaics and printed electronics to be more attractive in the practical applications. However, this challenge is well recognised and based on the enthusiastic atmosphere of the "Printed Electronics Europe 2009" and "Photovoltaics Beyond Conventional Silicon Europe 2009", the performance brickwall may very well be eventually broken.